Calorimetric Investigations of Organic Electronic and Organic Photovoltaic Materials

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Organic photovoltaic (OPV) devices hold great promise to enable low-cost, light-weight, and mechanically robust harvesting of solar energy due to the wide variety of materials that are available for photo-energy conversion andthe ability to apply high-throughput, material efficient production methods, such as inkjet or screen printing. Translation of the great promise of OPV to commercial devices has been stymied due to poor device efficiencies, which have been hypothesized to result from a combination of morphological (dimension, orientation, and distribution of components) and photo-physical (overlap of the absorption spectra with the solar spectrum) origins. To prepare new polymers that optimize both the morphology and the solar spectrum mismatch, more information is needed about the morphology of the bulk heterojunction and the role polymer architecture and processing conditions play in the formation of various morphological motifs. In this presentation we describe recent results from our laboratory investigating the thermal transitions of the P3HT and PCBM in standard devices using a combination of traditional differential scanning calorimetry (DSC) and chip-based differential AC nanocalorimetry, and examine the insights our results provide into the problem of optimizing materials for OPV processing.